Oct. 16, 1945. F. D. BRYANT 2,387,055

ELECTRIC SWITCH FOR DISCHARGE LAMPS

Filed May 20, 1942

Fig. 1.

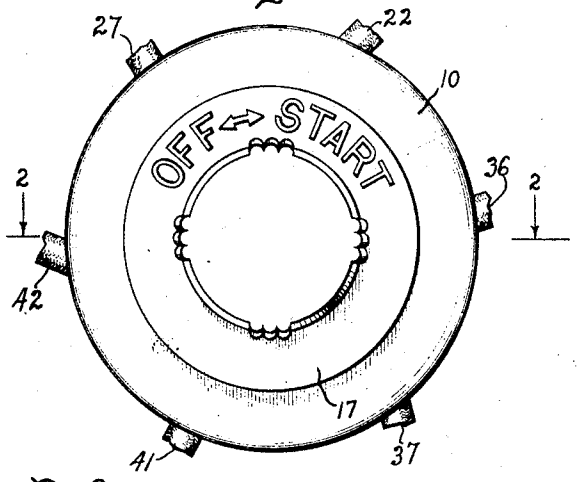


Fig. 3.

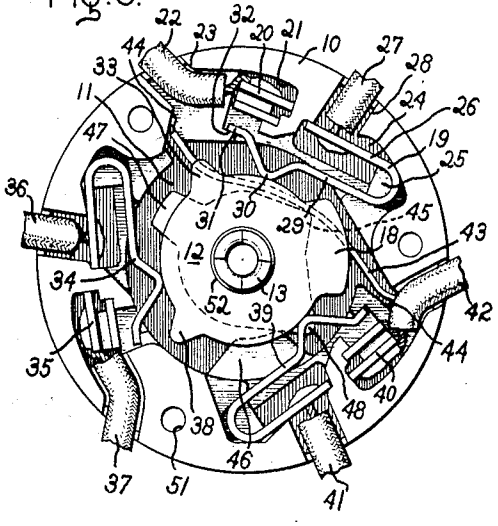


Fig. 2.

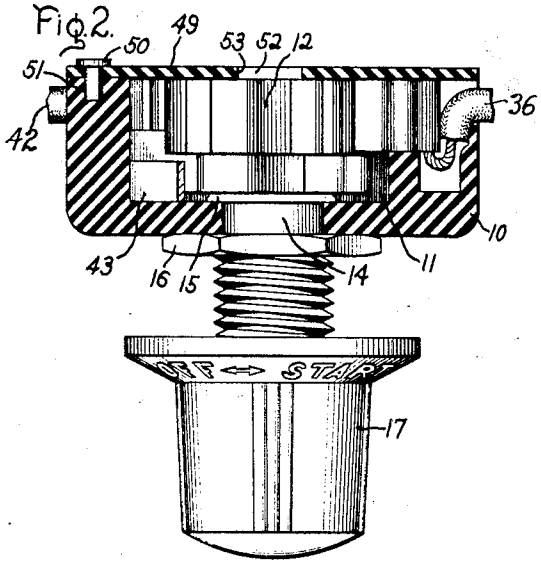


Fig. 4.

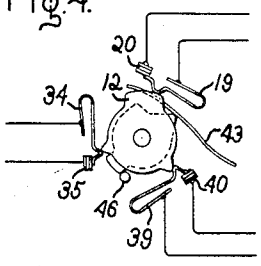
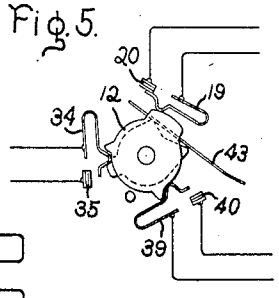


Fig. 5.



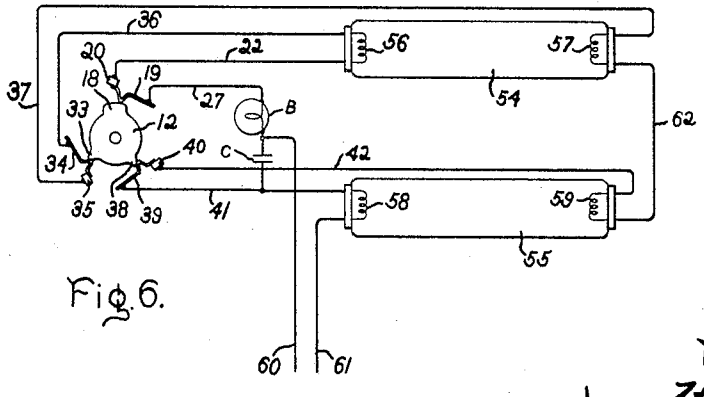


Fig. 6.

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2,387,055

ELECTRIC SWITCH FOR DISCHARGE LAMPS

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Application May 20, 1942, Serial No. 443,701

8 Claims. (Cl. 200—6)

My invention relates to an operating mechanism for discharge lamps, such as fluorescent lamps of the type now in commercial use, and more particularly to a switch for operating the lamps.

The object of my invention is the provision of a new and improved switch mechanism for use with such lamps, which is simple and relatively inexpensive to manufacture and which may be used to operate one or more lamps as required.

In the accompanying drawing, Fig. 1 is a front view of the switch; Fig. 2 is a cross-sectional view of the switch taken along the line 2—2 of Fig. 1; Fig. 3 is a view of the interior of the switch with the back cover plate removed; Figs. 4 and 5 are diagrammatic showings of the switch in various operative positions, and Fig. 6 shows one way of connecting the switch to a plurality of fluorescent lamps.

Tubular discharge lamps, such as fluorescent lamps, of the type now on the market are provided with filaments at each end of a glass envelope which are heated to a point at which they become emissive so that an arc may be struck between the filaments, lighting the lamp, Switch means must be provided for controlling the flow of current through the filaments for a predetermined period to heat them to a point at which they become emissive after which the flow of current is interrupted causing an arc to strike across the filaments, lighting the lamp. It is to a switch of this type that my invention relates.

Referring to the drawing, my switch comprises a base 10 of insulating material, such as a molded plastic, provided with a recess 11. Within the recess is a rotatable cam or operating member 12 mounted on a shaft 13 which, in turn, rotates in a bearing member 14. The bearing member is formed as a threaded nozzle or nipple and serves to mount the switch in position on a supporting panel, or the like. It extends through the bottom wall of the recess and is peened over, as indicated at 15 in Fig. 2, to secure it to the wall of the housing. A lock nut 16 is carried on the threaded nipple and serves to lock the switch in position on the supporting panel. The switch is operated by means of a handle 17 fitted on shaft 13.

As shown most clearly by Fig. 3, the annular wall of the housing surrounding the recess 11 carries a plurality of fixed and movable contact members which are operated by the rotatable member 12. The member 12 is provided with a cam surface 18 which cooperates with a movable contact 19 to move it into engagement with a fixed contact 20. The fixed contact 20 is formed as a U-shaped strip of metal, such as spring bronze, and rests in a slot 21 with the U-bend resting on the bottom of the slot. A conductor 22 is secured in any suitable manner to the contact, as by soldering, and rests in a groove 23 extending from the slot to the outer periphery of the housing.

Similarly, the movable contact 19 is formed as a U-shaped strip of spring bronze but in this case the arms of the U are made longer and the contact is mounted in position edgewise. It rests in a slot 24 with the bend in the U disposed around a bearing hub 25 extending upwardly from the bottom wall of the slot. One arm of the U designated 26, is secured in any suitable manner, as by soldering, to a conductor 27 which rests in a groove 28 extending from the slot to the outer periphery of the housing the same as the groove 23. The other arm of the U, designated 29, is formed with a projecting portion 30, which normally rides in engagement with the outer periphery of the operating member 12; it is also formed with a contact surface 31 which cooperates with the fixed contact 20. Normally, contacts 19 and 20 are open. In this position, the contact surface 31 rests against an abutment 32 forming part of the wall of the slot 21. The remaining contact members disposed around the wall of the housing are constructed in the same manner as those already described and are similarly mounted in slots in the housing. For this reason, these contacts will be only briefly described hereinafter with particular reference to the manner in which they are operated by the rotatable member 12 and the manner in which they are connected into the lamp circuit.

The operating member 12 is provided with a second cam surface 33 which cooperates with a movable contact member 34 to move it into engagement with a fixed contact 35. Conductors 36 and 37 are fastened to the contacts 34 and 35, respectively, in any suitable manner as by soldering. A third cam surface 38 formed on the operating member cooperates with still another movable contact 39 to move it into engagement with a fixed contact 40. Here again, the contacts 39 and 40 are provided with conductors 41 and 42, respectively, for connection to the lamp circuit.

The position of the operating member 12 is controlled, in a manner to be described later, by a leaf spring 43 the ends of which are disposed in grooves 44 formed in the wall of the housing. The spring cooperates with a projection 45 formed

in the periphery of the member 12 at a point below the cam surfaces 18, 33 and 38. This means that the spring blade does not interfere with rotation of the cam surfaces into engagement with the respective movable contact members.

Counter-clockwise rotation of the operating member 12, as viewed in Fig. 3, is limited by a stop 46 with which a projection 47 on the operating member engages. In a similar manner, a second projection 48 limits rotation in a clockwise direction.

All of the contact members are held in position on the base by a closure plate 49 of any suitable insulating material, such as sheet fiber. The plate is fastened to the base by drive pins 50 forced into openings 51 molded in the base. In addition to holding the contact members in position, the plate serves as a bearing surface for the rotatable operating member 12. To this end, the operating member is formed with an extending or bearing portion 52 which rotates in an opening 53 formed in the plate 49. In this way, the operating member is securely and accurately held in position in the housing; at one end it is supported for rotation in the plate 49 while otherwise it is mounted on the shaft 13 which, in turn, rotates in the nipple 14. The manner in which the switch is connected in circuit with a plurality of fluorescent lamps will now be described.

Referring to Fig. 6, I have shown my switch connected in circuit with two fluorescent lamps 54 and 55 of the well known type now in commercial use. The lamp 54 is provided with filaments 56 and 57 at opposite ends while the lamp 55 is likewise provided with filaments 58 and 59. The lamps and switch are connected to a source of alternating or direct current by supply lines 60 and 61. They are likewise connected into the circuit shown with a ballast B which is an ordinary incandescent lamp. In those cases where the fluorescent lamps 54 and 55 are of the 15 inch, 14 watt type for use with a current supply of approximately 110 volts, the ballast B is a lamp rated at 60 volts, .5 ampere.

In normal "off" position, the operating member 12 is turned to the position shown by Fig. 3 so that all of the contacts are open. When it is desired to light the lamps, the operating member is turned counterclockwise (which corresponds to clockwise rotation of the operating handle in the showing of Fig. 1) until the projection 47 engages the stop 46. This causes the cam surfaces 18, 33 and 38 to engage the corresponding movable contact members moving them to closed circuit position; this is the position of the switch shown by Figs. 4 and 6 and is known as the "start" position. At the same time, the projection 45 biases the leaf spring 43. Current now flows through the circuit in the following manner.

Current from supply line 60 flows through ballast B, line 27, movable contact 19, fixed contact 20, line 22 to filament 56 in lamp 54, then by line 36, movable contact 34, fixed contact 35, line 37 to the other filament 57, then by a conductor 62 to the filament 59 in lamp 55, through conductor 42, fixed contact 40, movable contact 39, line 41 to the other filament 58 and thence to the other side 61 of the current supply. In this manner, current flows through all the filaments in series of both lamps and likewise through the lamp ballast B.

The switch mechanism is manually held in this position for a predetermined time interval, on the order of one to five seconds, until the lamp filaments are sufficiently heated. The handle of the switch is then released from the hand without further turning. When this is done, the leaf spring 43, which has been previously biased by the projection 45, rotates the operating member 12 clockwise (which corresponds to counter-clockwise rotation of the handle 17 in the showing of Fig. 1) a small amount to the position shown by Fig. 5. This opens the movable contacts 34 and 39 but since the cam surface 18 extends along a considerable portion of the periphery of the member 12, compared to the cam surfaces 33 and 38, the movable contact 29 is not opened. Upon release of the switch in the manner indicated, the circuit through the movable contacts 34 and 39 is interrupted causing a glow discharge to strike between the respective pairs of filaments lighting the lamps.

When this occurs, current flows from supply line 60, through ballast B, line 27, movable contact 19, fixed contact 20, line 22 to filament 56, across the glow discharge in lamp 54 to the other filament 57 then by conductor 62 to filament 59 of the other lamp 55, across the glow discharge in the lamp to filament 58 and thence to the other supply line 61. When lighted, the lamps 54 and 55 are still electrically connected in series with the lamp ballast B which limits the flow of current across the glow discharge paths. A condenser C when connected across lines 60 and 41 eliminates radio interference.

When it is desired to turn the lamps off, the operating member 12 is manually rotated clockwise until projection 48 engages stop 46 so that the circuit through movable contact 19 is opened interrupting the supply of current; this position of the switch is shown by Fig. 3.

While I have illustrated my switch as connected into a fluorescent lamp operating circuit utilizing a lamp ballast, it should be manifest that it may be used in a circuit employing a reactor ballast in a manner which is well understood in the art. Moreover, by employing a suitable ballast, my switch may be used to operate only a single lamp in which case only one of the two movable contacts 34 and 39 is used.

My switch is one which is very compact making it especially suitable for mounting directly in lighting fixtures, such as floor lamps. It comprises relatively few parts which are easily manufactured at low cost since all of the fixed and movable contact members are constructed exactly alike. The contacts are easily and quickly assembled in the slots in the housing and are retained in position by the cover plate without the necessity of using separate fastening means.

Thus, with my invention I have accomplished an improved switch construction for starting and operating fluorescent lamps. Broadly, a switch according to my invention comprises an insulating base or casing forming a chamber and a plurality of circumferentially spaced pairs of contacts or contact means supported in the chamber. These circumferentially spaced contacts include at least a first pair of contacts supported on the chamber for normally operating a lamp and a second pair of contacts circumferentially spaced from the first pair and supported on the chamber for closing a starting circuit during the starting period of a lamp.

The contacts are actuated by an operating member rotatably supported in the chamber and having a plurality of circumferentially spaced cam surfaces including a first cam surface for operating a first pair of contacts and a second cam surface for operating a second pair of con-

tacts, the first cam surface extending over a greater angle than the second cam surface whereby the first pair of contacts may be kept in closed position during substantially angular movement of the operating member whereas the second pair of contacts may be kept closed only during a short angular movement of the operating member.

The operating member has a projection axially and circumferentially spaced from said cam surfaces and cooperatively associated with a stop projecting inward from the casing and arranged to engage said projection of the operating member upon closing of all contacts. The operating member includes other projections or cam surfaces cooperatively associated with a spring blade held on the casing and adapted to bias the spring blade upon turning of the operating member into switch closing position and to effect return movement of the operating member upon manual release in order to cause opening of the pairs of contacts for starting the lamp or lamps. Upon closing of all contacts, said spring is biased and engages a single projection or cam of the operating member. In this position the operating member can be held only by the application of manual force and upon release of such force the operating member is moved away or turned back a predetermined angular degree into the normal operating position in which the biasing spring engages two circumferentially spaced points on the operating member.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a switch mechanism, a base of insulating material having a recess therein, a plurality of spaced circuit controlling contacts in the wall of the base forming said recess, a rotatable operating member in said recess, said rotatable member being provided with a plurality of cam surfaces cooperating with said contacts to control an electrical circuit therethrough, and spring means adapted to bias said operating member, rotation of said operating member in one direction causing said cam surfaces to close said contacts and said spring means to bias said operating member, rotation of said operating member in the other direction by the biasing action of said spring means causing certain of said cam surfaces to open the cooperating contacts while one of said cam surfaces maintains a corresponding contact closed.

2. In a switch mechanism, a base of insulating material, a manual operating member rotatably mounted on said base and being provided with a plurality of cam surfaces spaced around the periphery thereof, one of said cam surfaces extending along a greater portion of the periphery than the others and circuit controlling contacts carried by said base and adapted to be opened and closed by cooperation with said cam surfaces, rotation of said operating member in one direction causing all said cam surfaces to close a corresponding contact, rotation of said operating member in the opposite direction causing said cam surfaces to open a corresponding contact with the exception that the said cam of greater extent maintains its contact closed.

3. In a switch mechanism, a base of insulating material, a manual operating member rotatably mounted on said base, said operating member being provided with a plurality of cam surfaces spaced around the periphery thereof, one of said cam surfaces extending along a greater portion of the periphery than the others, circuit controlling contacts adapted to be opened and closed by cooperation with said cam surfaces and a spring adapted to bias said operating member for rotation, manual rotation of said operating member in one direction biasing said spring and causing said cam surfaces to close said contacts, manual release of said operating member permitting said spring to rotate the member in the opposite direction causing said cam surfaces to open corresponding contacts with the exception that the cam of greater extent maintains its contact closed.

4. An electric switch comprising a base of insulating material, a manual operating member rotatably mounted on said base, said operating member being provided with a cam surface and a plurality of projections spaced around the periphery thereof, contacts carried by said base adapted to be opened and closed by cooperation with said cam and projections and a spring adapted to bias said operating member for rotation, said operating member being manually rotated in one direction a predetermined distance whereby said cam and projections close said contacts and said spring is biased, release of said operating member causing said spring to rotate it in the opposite direction less than the predetermined distance whereby the projections open their corresponding contacts but the cam maintains its contact closed.

5. An electric switch comprising a base of insulating material, a manual operating member rotatably mounted on said base, said operating member being provided with a plurality of cam surfaces spaced around the periphery thereof, one of which extends along a greater portion of the periphery than the others, contact means carried by said base including flexible contact blades cooperating with said cam surfaces and a spring cooperating with said operating member and being biased by rotation of said member in one direction to rotate it in the opposite direction upon manual release of said member.

6. An electric switch for starting and operating fluorescent lamps comprising a base forming a chamber, a plurality of circumferentially spaced pairs of contacts supported in the chamber, an operating member for the contacts rotatably supported in the chamber and having a plurality of circumferentially spaced cam surfaces for closing the respective pairs of contacts, one of the cam surfaces extending over a greater angle than the other cam surfaces, two spaced lateral projections on the operating member, a stop on the casing for engaging one of the projections in the switch closing position, and means including a flat spring held on the casing and cooperatively associated with the other projection to effect a predetermined return movement of the operating member when moved into switch closing position to open some of the pairs of contacts without affecting the pair of contacts actuated by said long cam surface.

7. Electric switch for starting and operating electric fluorescent lamps and the like comprising an insulating base forming a chamber, first contact and second contact means disposed in the chamber and supported on circumferentially spaced portions of the base, an operating member located in the chamber and rotatably supported on the base having a long cam surface for cooperation with the first contact means and a short cam surface for cooperation with the second contact means, manual means for rotating the operating member to effect closing of both

contact means, a projection on the operating member for engaging a stop on the base in the closing position, and means including a flat spring held on the casing and a projection on the operating member to cause movement of the operating member upon manual release to effect opening of the second contact means without affecting the first contact means.

8. Electric switch for starting and operating fluorescent lamps and the like comprising a base forming a chamber, circumferentially spaced operating and starting contact means supported in the chamber, and manually operable means for closing both contact means and upon manual release automaticaly to effect opening of the starting contact means comprising an operating member disposed in the casing having lateral projections and separate cam surfaces for actuating the operating and starting contact means respectively and a flat spring held on the casing and cooperatively associated with said projections to cause upon manual release a predetermined angular movement of the latter away from the starting position to effect opening of the starting contact means without affecting the operating contact means.

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